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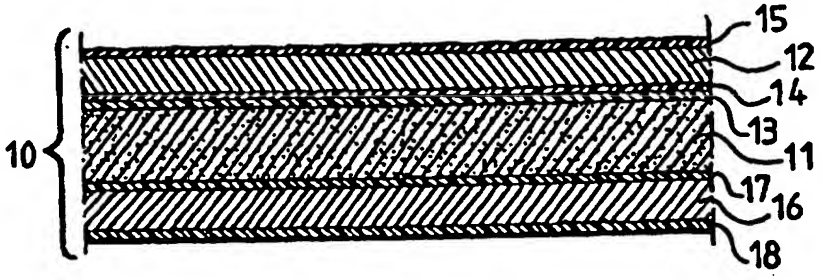
(54) Title: A PACKAGING CONTAINER INTENDED FOR THE COLD STORAGE OF LIQUID FOODS IN ICE OR WATER

(57) Abstract

The disclosure relates to packaging containers of a packaging laminate which may be stored in ice, water or high air humidity with retained configurational stability and grip rigidity properties, as well as to use for storage of liquid foods in a cold storage medium containing liquid. The packaging laminate (10) consists of a fibre core layer (11) and an outside layer comprising a layer (12) of a plastic selected from a group consisting of polypropylene, HDPE and polyester. The above-mentioned plastic layer is preferably a biaxially oriented film. On the inside of the core layer, an additional, stability-increasing layer (16) may be applied, such as, for example, an aluminium foil. The retained superior grip stability of a packaging container made from the packaging laminate described with reference to the figure is believed to be a combination of factors such that the outer layer of the packaging container first has improved liquid barrier properties, secondly has greater thickness and thirdly has higher material rigidity in conventionally employed outer layers in packaging containers of the above-described type. In addition, the I-beam effect which occurs as a result of the rigid outside layer (12) and the rigid layer (16) on the inside of the core layer cooperating with the interjacent core layer (11) contributes to retaining configurational and grip stability in a damp or humid environment.



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A PACKAGING CONTAINER INTENDED FOR THE COLD STORAGE OF LIQUID FOODS IN ICE OR WATER

TECHNICAL FIELD

The present invention relates to a packaging container possessing superior storage stability on storage in a storage medium containing liquid, the packaging container being produced from a laminated packaging material comprising a core layer of a fibre material with a layer of plastic applied on the outside of the packaging container. The present invention moreover relates to the use of the packaging container for storage of liquid foods in a cold storage medium containing liquid.

BACKGROUND ART

In the packaging industry, use has long been made of packages of a single-use disposable nature (so-called single use packages) for packing and transporting liquid foods.

A large group of packaging materials for such single-use disposable packages comprises a core layer of paper or paperboard and outer, liquid-tight layers of polyethylene, normally low density polyethylene (LDPE).

The composition of such a packaging material is intended to impart to the packed product the best possible product protection properties, at the same time as it is to render the package easy to produce and easy to handle. A core layer of paper or paperboard imparts to the package good mechanical configurational stability so that the package may be distributed and handled in a simple and rational manner. The outer, liquid-tight coatings of polyethylene protect the core layer against moisture and liquid.

Depending upon the storage time and the product that is to be packed, the packaging material may also include different metal layers or plastic layers possessing barrier properties against light or gases, such as for example oxygen gas.

Such packaging containers are often produced in that a web of packaging material is reformed into a tube by the longitudinal edges of the web being united with one another, whereafter the tube is filled with the intended contents and sealed along narrow, transverse mutually spaced apart sealing zones. The thus sealed-off portions of the tube containing their contents are thereafter separated from the tube by means of incisions in the

above-mentioned sealing zones and are formed by folding into optional geometric configuration, depending on how the sealing joints or seams are oriented.

The above-described packaging container is normally not subjected to extremely damp or humid conditions for any length of time, for which reason it is often sufficient to coat the core layer with one layer of LDPE on both sides. In many countries however, the climatic conditions are such that cooling is required both during transport and during storage, at the same time as access to refrigerated transport facilities and refrigerated storage facilities is limited in certain areas. It is then common to cool food products with ice in boxes or crates of a thermally insulating material. With the passage of time, the ice melts so that the coolant gradually comes to consist of a mixture of ice and water, and finally of water alone. It has then proved that packaging containers of the above-described type, after a certain storage time, lose configurational stability and so-called grip rigidity properties because of the fact that exposed incision edges of the core layer (which gives the packaging container its configurational stability and rigidity) absorb water and become soft and sloppy. A lengthy period of storage at high relative humidity, such as between 80 and 100% RH also has the effect that the fibres in the core layer absorb moisture so that the stability properties of the packaging container deteriorate.

OBJECTS OF THE INVENTION

One object of the present invention is therefore to realise a novel packaging container of the type described by way of introduction which does not suffer from the inherent drawbacks of the type intimately related with the prior art technology.

A further object of the present invention is to realise a packaging container of the above-described type which, on storage in a cold storage medium containing liquid, possesses superior storage stability, i.e. almost totally retains its superior configurational stability and grip rigidity properties, even after a lengthy storage period.

Yet a further object of the present invention is to realise a packaging container of the above-described type which, on storage in high relative humidity, of the order of between 80 and 100% RH, almost totally retains its superior configurational stability and grip rigidity properties, even after a

lengthy storage period.

SOLUTION

These and other objects are attained by means of a packaging container with the characterizing feature as set forth in the characterizing clause of appended Claim 1. Preferred embodiments of the packaging container according to the present invention have further been given the characterizing features as set forth in appended subclaims 2 to 8.

OUTLINE OF THE INVENTION

By coating the core layer with a thicker and more rigid layer of a plastic selected from a group consisting of polypropylene, high density polyethylene (HDPE), and polyester instead of LDPE, better protection will be obtained against the penetration of liquid and moisture into the core layer, at the same time as such a layer of the above-mentioned polypropylene, HDPE or polyester contributes, because of its superior rigidity properties, to such a laminated packaging material - seen as a whole - also obtaining improved rigidity properties.

Preferably, the plastic layer consists of an oriented polypropylene, oriented HDPE or an oriented polyester and, according to one preferred embodiment of the present invention, of a biaxially oriented polypropylene, biaxially oriented HDPE or a biaxially oriented polyester. The type of polymer is selected such that the combination of its rigidity properties and moisture barrier properties with a suitable layer thickness entails that the packaging container may be stored in a liquid without appreciably losing its configurational stability and grip stability properties.

Preferably, a film of an oriented or biaxially oriented polypropylene, HDPE or polyester is laminated onto the core layer by the intermediary of the extrusion of a thin interjacent lamination layer of, for example, polyethylene.

Depending on storage time and the product which is to be packed, the packaging material often includes additional layers with light barrier properties or gas barrier properties, for example against oxygen gas. Normally, such a layer is applied on that side of the core layer which is turned to face towards the inside of the packaging container, but may also be applied on the other side of the core layer. Such a barrier layer may consist of

a metal layer such as, for example, an aluminium foil or a thin layer of metal or metal oxide such as, for example silicon oxide (SiOx, where x is 1.5 - 2.2), which has been deposited on a plastic layer of oriented polypropylene, HDPE, or oriented polyester. Alternatively, the gas barrier layer may consist of a plastic layer comprising a polymer possessing superior gas barrier properties such as, for instance, ethyl vinyl alcohol (EVOH) or polyvinyl alcohol (PVAL).

In order further to protect the packaging container against the penetration of moisture and liquid, it is possible to protect incision edges (if any) which occur on the outside of the packaging material of the packaging container against exposure to water. Such protection is realised in a per se known manner by coating or impregnating the incision edges with a mechanically or chemically water-repellent agent. For example, the incision edges may be covered with a plastic strip which is laminated or glued in place on the packaging material around each respective incision edge, or these incision edges may be impregnated with a hydrophobic liquid substance such as, for example, an oil or a fat of some type. Incision edges in overlap joints may alternatively be folded in under the overlapping packaging material so that they are not exposed to surrounding moisture or liquid.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

One preferred embodiment of the present invention will now be illustrated/described in greater detail hereinbelow, with particular reference to the accompanying Drawings in which:

Fig. 1 schematically illustrates a preferred packaging material according to the present invention;

Figs. 2a and 2b show how the flexural strength and moisture content, respectively, in a packaging material according to Fig. 1 in a packaging container produced from the packaging material varies with storage time in water at 5°C; and

Figs. 3a and 3b show how the flexural strength and moisture content, respectively, in a packaging material according to Fig. 1 in a packaging container produced from the packaging material vary with storage time in high relative humidity, i.e. between 80 and 100% RH.

It should however be observed that while the present invention is

described in greater detail with particular reference to the embodiment specifically illustrated in Fig. 1, it will be obvious to a person skilled in the art that different modifications and variations may be made without departing from the inventive concept as this is defined in the appended Claims.

DESCRIPTION OF PREFERRED EMBODIMENT

Fig. 1 thus schematically illustrates an example of a packaging material according to the present invention carrying the generic reference numeral 10. The laminated packaging material comprises a core layer 11 of, for example, paper or paperboard of a conventional packaging quality. On that side of the core layer which will be turned to face inwards towards the interior of the packaging container, there is disposed a film consisting of biaxially oriented polypropylene, BOPP, 12.

In the packaging material 10 according to the invention, the layer 12 may, for example, be laminated to the core layer by the intermediary of a thin, extruded plastic layer 13 of, for example, polyethylene. The film 12 of BOPP is, for example, suitably coated on both sides with a thin layer 14;15 of an adhesion-promoting or thermosealable polymer.

On that side of the core layer which, in a finished packaging container, is turned to face in towards the interior, an additional layer 16 may be applied which increases stability, and this layer may moreover possess superior gas barrier properties. Such a layer 16 increasing stability may consist of a metal, such as, for example, an aluminium foil. Preferably, such an aluminium foil 16 is laminated to the core layer 11 by the intermediary of extrusion of a thin plastic layer of, for example, polyethylene 17. In order to protect the packed product against direct contact with metal (which should be prevented as far as the packing of foods is concerned), the aluminium layer 16 on the inside of the packaging container is suitably clad with a plastic layer 18 of, for example, polyethylene, this plastic layer moreover being thermosealable.

In Figs. 2a and 2b, and also in Figs. 3a and 3b, the packaging material of the type described with reference to Fig. 1 has been tested on storage in water and at relatively high humidity, such as 80-100% RH, respectively, at 5°C.

In the packaging material tested in Figs. 2 and 3, the layer 12 consisted

of a film of approximately 18μm thick BOPP, which is clad on both sides with a 0.6-0.7μm thin layer 14;15 of an adhesion-promoting and thermosealable polymer. The film 12 is laminated on the core layer 11 by the intermediary of extrusion of approx. 12 μm of low density polyethylene (LDPE) and, in the same manner, the aluminium foil is laminated to the other side of the core layer by the intermediary of approx. 25μm of LDPE. On the other side which is turned to face inwards in the packaging container, the aluminium foil 16 is clad with approx. 35μm of LDPE, 18. The core layer 11 consists of a paper of a packaging quality, for example of the type known as so-called liquid paperboard, with a rigidity of 80 mN.

The tested packaging material 10 has been compared with a packaging material of conventional type with the same configuration as the packaging material 10, but without the film 12. In the conventional packaging material, the core layer is, thus, coated with an extruded layer of 12 μm low density polyethylene (LDPE) on that side which is turned to face towards the outside of the packaging container.

Parallelepipedic packaging containers of a volume of 250 ml of the Tetra Brik® type, produced from the packaging material were test stored for 12 days. Measurements were made on 15 packages in each test after 1, 2, 5 and 12 days.

The flexural strength has been measured in accordance with SCAN P 29:84 in test equipment of the Lorentzon & Weltre brand, code 16. The values of the flexural strength GM given in the diagrams are a geometric mean value of the flexural strength measured, partly in the machine direction (MD) and partly in the cross direction (CD), i.e. $GM = \sqrt{(MD \times CD)}$.

It will be apparent from Figs. 2a and 3a that the flexural strength of the test material 10 according to the invention is as good as totally retained on storage for 12 days in water and air at high humidity, respectively, while the flexural strength of a corresponding conventional packaging container is reduced by approx. 20 per cent after 1 day, and by approx. 30 per cent after 12 days' storage in water, and by approx. 10 per cent after 12 days' storage at high humidity.

It will be further apparent from Figs. 2b and 3b that the moisture content in the packaging materials in the same storage test increases in both the test material and in the conventional packaging material, but less in the test material according to the present invention.

The rigidity of the paper material in the core layer is considerably higher than in the LDPE layer, for which reason this latter does not appreciably contribute to the overall rigidity of the packaging material.

The rigidity of the packaging material in the core layer reduces with increasing moisture content, with the result that the total rigidity of the packaging material is also reduced.

When the core layer is instead laminated with an outside layer of a plastic material which, on the one hand, is rigid in both the machine direction (MD) and in the cross direction (CD), and on the other hand, permits lower moisture penetration than conventional outside layers of polyethylene, the packaging material in its entirety will be more rigid and more stable also in extremely damp conditions.

In the tested packaging material 10, there will moreover be obtained an I-beam effect between the rigid outer layer 12 and the metal foil 16 on the inwardly facing side of the core layer. The sloppiness in the moist (or alternatively wet) core layer is compensated for by the rigidity of the two surrounding layers 12, 16. Probably, this I-beam effect increases with increasing thickness of the core layer, since the fibres then swell more on absorption of moisture and the distance between the two rigid layers increases. This effect thus contributes in such a packaging material retaining its pristine rigidity in water and in high air humidity.

Other tests have also shown that the grip rigidity of a packaging container of the test material 10 was retained after several days' storage in water, while a conventional package lost grip rigidity and became sloppy.

The retained, superior grip stability of a packaging container made from the packaging laminate described with reference to Fig. 1 is believed to be a combination of such factors that the outer layer of the packaging container, first, possesses better liquid barrier properties, secondly, has greater thickness, and thirdly has higher material rigidity than conventionally employed outer layers in packaging containers of the above-described type.

Preferably, the outer plastic layer selected from a group consisting of polypropylene, HDPE and polyester, has a thickness of at least 10 μm combined with an E-modulus of at least 1000 MPa in both machine and cross directions.

According to one preferred embodiment, the above-mentioned outer

plastic layer has a thickness of at least 15 μm and/or an E-modulus of at least 2000 MPa in both the machine and cross directions.

According to a further preferred embodiment, the above-mentioned outer plastic layer has an E-modulus in the machine and cross direction, respectively, of at least 3000 MPa.

A not inconsiderable contribution to the retention of the good grip stability is thus that the rigid outside layer cooperates with the rigid layer on the other side of the core layer - in this case the aluminium foil, and gives an I-beam effect with the interjacent core layer.

As will have been apparent from the foregoing description, the present invention realises a packaging container which, like a packaging container of plastic or metal, is suitable for cold storage in water or ice and which may be stored in relatively high humidity, i.e. of the order of 80-100% RH, without losing its superior configurational stability and grip rigidity properties, even after a lengthy period of storage.

WHAT IS CLAIMED IS:

1. A configurationally stable packaging container possessing superior storage stability on storage in a storage medium containing liquid, the packaging container being produced from a laminated packaging material (10) comprising a core layer (11) of a fibre material with a layer of plastic (12) applied on the outside of the packaging container, characterized in that the plastic layer (12) disposed on the outside of the packaging container comprises a plastic selected from the group which consists of polypropylene, HDPE and polyester.

2. The packaging container as claimed in Claim 1, characterized in that said plastic layer (12) comprises a layer of oriented polypropylene, oriented HDPE or oriented polyester.

3. The packaging container as claimed in Claim 2, characterized in that said layer of polypropylene, HDPE or polyester is biaxially oriented.

4. The packaging container as claimed in any of Claims 1 to 3, characterized in that the laminated packaging material (10) also includes a stability-increasing layer (16) on the inside of the packaging container.

5. The packaging container as claimed in Claim 4, characterized in that said stability-increasing layer (16) consists of an aluminium foil.

6. The packaging container as claimed in any of Claims 1 to 5, characterized in that any possibly occurring incision edges on the outside of the packaging container are protected against exposure to water.

7. The packaging container as claimed in Claim 6, characterized in that incision edges are mechanically protected by being folded in under overlapping packaging material, or by being covered with a protective plastic strip.

8. The packaging container as claimed in Claim 6, characterized in that incision edges are chemically protected by impregnation with a hydrophobic

liquid substance.

9. Use of a packaging container according to any of Claims 1 to 8 for storing liquid foods in a cold storage medium containing liquid.

10. Use as claimed in Claim 9, characterized in that said storage medium containing liquid is a mixture of ice and water.

Fig.1

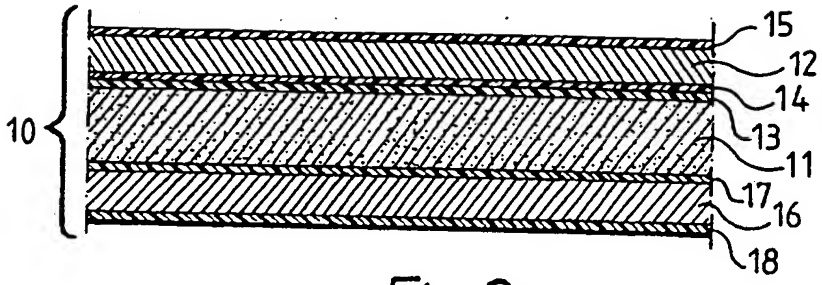


Fig.2a

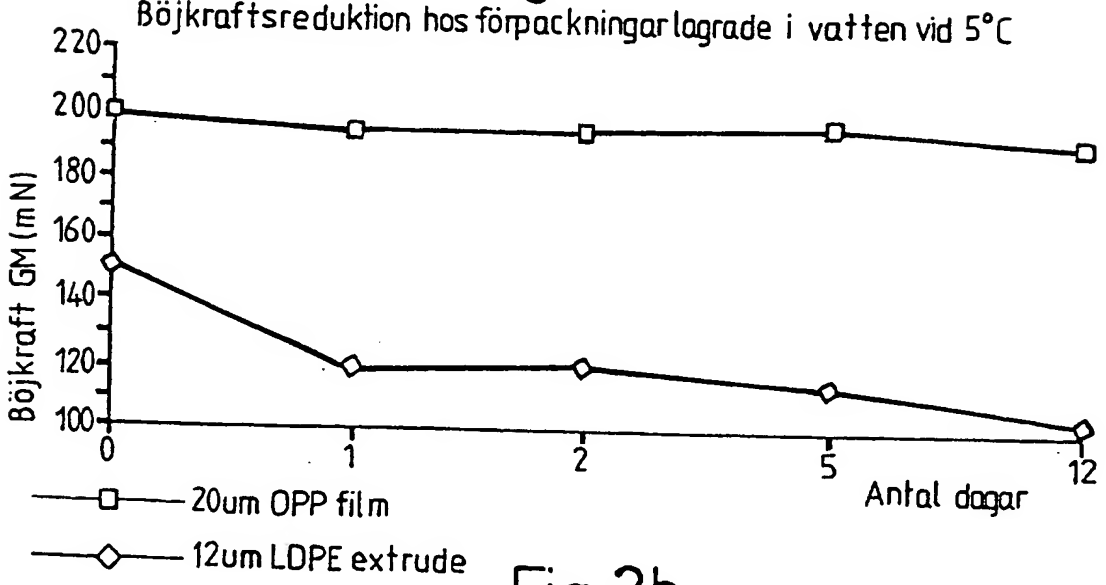


Fig. 2b

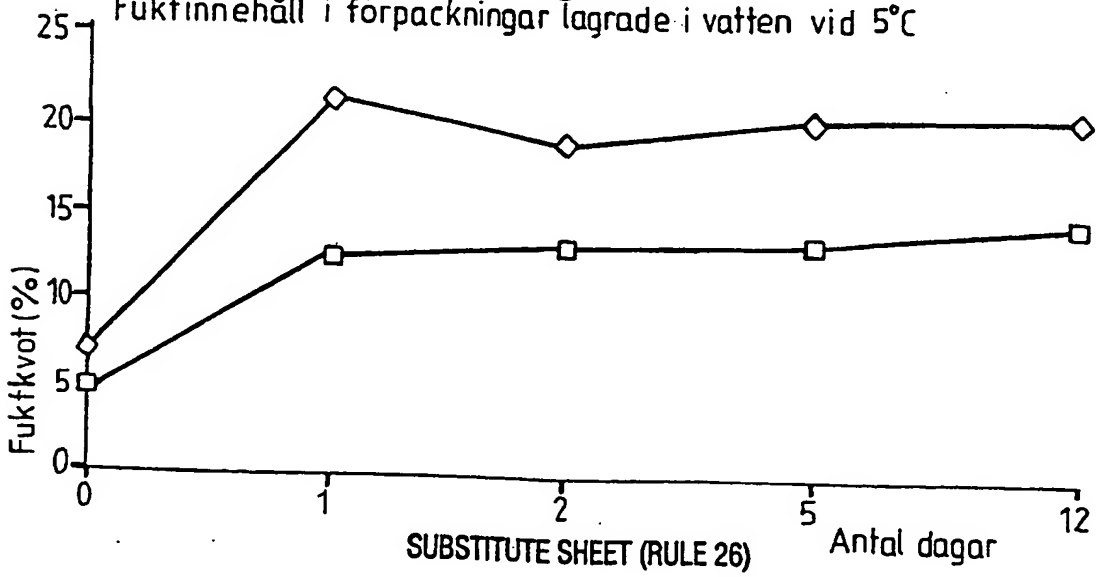
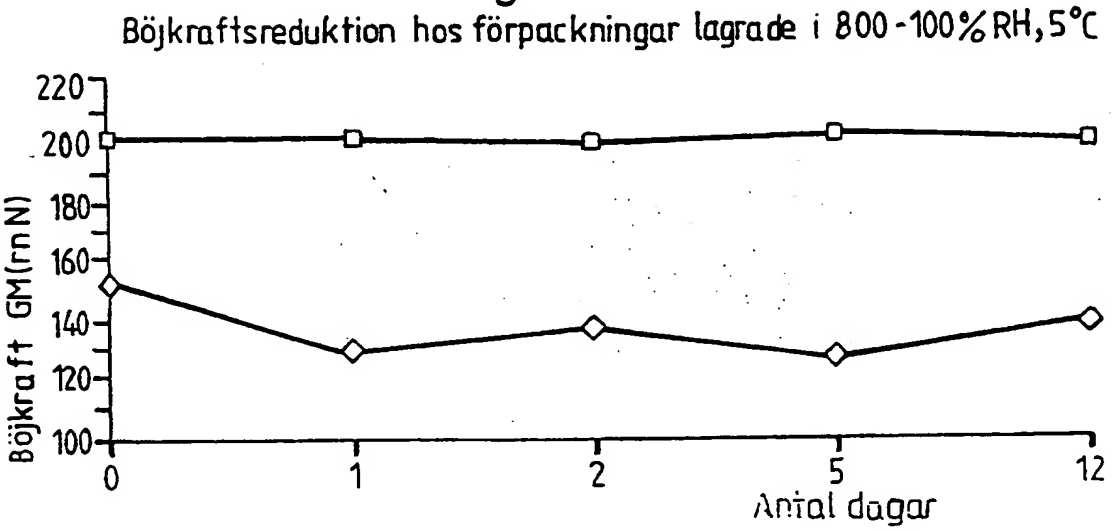


Fig.3a


Böjkraftsreduktion hos förpackningar lagrade i 800-100% RH, 5°C
Böjkraft GM(mN)
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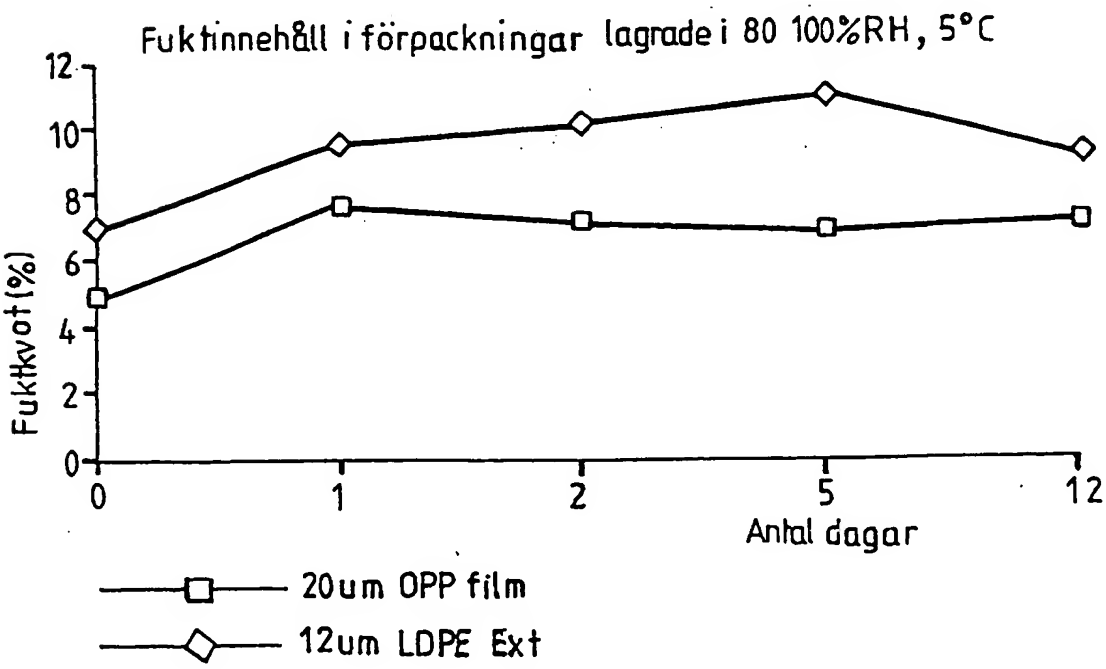
200
180
160
140
120
100
0
1
2
5
12
Antal dagar

Fig.3b


Fuktinnehåll i förpackningar lagrade i 80 100%RH, 5°C
Fuktkvot (%)
12
10
8
6
4
2
0
0
1
2
5
12
Antal dagar
20um OPP film
12um LDPE Ext

INTERNATIONAL SEARCH REPORT

Inter. ational application No.
PCT/SE 97/01133

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65D 65/40, B32B 27/10
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65D, B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Dialog Information Services, File 351, DERWENT WPI, Dialog accession no. 009027145, WPI accession no. 92-154505/19, TOPPAN PRINTING CO: "Waterproof paper container prepn. - involves laminating biaxially stretched HDPE film on inner surface and stretched polyolefin on outer surface of waterproof paper"; & JP,A,4090343, 920324, 9219 --	1-10
X	Dialog Information Services, File 351, DERWENT WPI, Dialog accession no. 008038579, WPI accession no. 89-303691/42, SHOWA DENKO KK: "Co-extrusion coated laminate prodn. - by laminating high density polyethylene layer, low densitypolyethylene layer, and substrate layer"; & JP,A,1222920, 890906, 8942 --	1-10

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/01133

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Dialog Information Services, File 351, DERWENT WPI, Dialog accession no. 009361583, WPI accession no. 93-055061/07, TOPPAN PRINTING CO LTD: "Enclosed angular cardboard container is laminated with resin layer composed of low adsorptive polyester resin"; & JP,A,5004638, 930114, 9307	1-10

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